STRATIGRAPHIC GEOLOGY OF THE PENNINGTON OF EASTERN KENTUCKY AND EAST CENTRAL TENNESSEE

By

VIRGIL DEAN WINKLER

A. B., B. S., University of Illinois, 1938

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AN ABSTRACT OF A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN GEOLOGY IN THE GRADUATE SCHOOL OF THE UNIVERSITY OF ILLINOIS, 1941

URBANA, ILLINOIS

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ACKNOWLEDGMENTS

The author wishes to acknowlege the information and aid given by C. L. Cooper of the Illinois State Geological Survey, K. E. Born of the Division of Geology of the State of Tennessee, and A. C. Munyan of th Georgia Division of Mines, Mining and Geology and to their organizations. Special thanks are due A. H. Sutton, of the Department of Geology of the University of Illinois who suggested this problem and gave kindly suggestions and aid during supervision of the field work and preparation of the manuscript. Thanks are also due to H. R. Wanless and H. W. Scott of the same department, A. C. McFarlan of the Department of Geology, University of Kentucky, and to J. W. Sullivan of the Department of Geology, Colgate University. The Henry Strong Fellowship Fund made this work possible.

STRATIGRAPHIC GEOLOGY OF THE PENNINGTON OF EASTERN KENTUCKY AND EAST CENTRAL TENNESSEE

This study was undertaken in order to determine the nature and areal extent of the Pennington formation and to attempt to make more specific correlations with the type formations of the Elvira group (upper Chester) of the Mississippi Valley area. One summer was spent in measuring sections and making collections.

The western outcrops of the Pennington formation occur along the western side of the Cumberland Plateau from northeastern Kentucky through east central Tennessee into northeastern Alabama, a distance of about 250 miles. The outcrop belt is about 15 miles wide.

The following twenty-seven measurable sections were found, none of which are completely exposed.

Section 1. Limestone quarry 4.2 miles west of Wrigley near Blair's Mill in Morgan County, Kentucky.

Section 2. Limestone quarry 1.1 mile northwest of Highway 40 about midway between Mariba and Deniston, 1.2 mile southwest of Wellington, Menifee County, Kentucky.

Section 3. Along Highway 15 about 2.5 miles northeast of Slade, Powell County, Kentucky.

Section 4. Along the ridgetop road about 4 miles south of Stanton and north of Furnace, Powell County, Kentucky.

Section 5. Along Highway 21 about 2 miles from Clover Bottom and 3 miles west of Sand Gap, Jackson County, Kentucky.

Section 6. Along Highway 21 one-eighth mile northwest of McKee, Jackson County, Kentucky.

Section 7. Along the Indian Creek road about 4.5 miles south of McKee, Jackson County, Kentucky.

Section 8. Limestone quarry on Indian Creek road about 5 miles south of McKee, Jackson County, Kentucky.

Section 9. Along Highway 25 5 miles southeast of Livingston, Rockcastle County, Kentucky.

Section 10. Along Highway 25 .5 mile northwest of Livingston, Rockcastle County, Kentucky.

Section 11. In quarry and along Highway 80 at bridge over the Rockcastle River at the Rockcastle-Laurel County Line.

Section 12. Along the old road between Acorn and Ano, Pulaski County, Kentucky.

Section 13. Along Highway 27 3.4 miles southeast of Burnside, Pulaski County, Kentucky.

Section 14. Along Highway 27 about .5 mile southeast of section 13, Pulaski County, Kentucky.

Section 15. Along Highway 27 about 200 feet south of section 14 and 300 yards northeast of Sloan's Valley Post Office, Pulaski County, Kentucky.

Section 16. Along Highway 27 6.3 miles southeast of stoplight in Burnside, Pulaski County, Kentucky.

Section 17. Along road from Monticello to Gregory, Wayne County, Kentucky. 5 miles northeast of center of Monticello. 2.6 miles on Gregory road from junction with Highway 92E.

Section 18. Along Highway 52 about 2 miles west of Jamestown, Fentress County, Tennessee.

Section 19. Along Highway 85 about 1.5 miles east of Wilder, Fentress County, Tennessee beginning at the bridge over the East Fork of the Obey River.

Section 20. Along gravel road from Monterey to Rickman, Putnam County, Tennessee. At northwest outskirts of Monterey.

Section 21. In cut of the Central of Tennessee Railroad where the road from Monterey to Algood, Putnam County, Tennessee crosses it, near Bilbrey.

Section 22. .8 mile long on Highway 70N 4.1 miles southwest of the junction of 70N with 84 and 5.5 miles southwest of Monterey, Putnam County, Tennessee.

Section 23. Along Highway 70S leading from Sparta to top of Bon Air Mountain. Starts 4.6 miles east of center of Sparta, White County, Tennessee.

Section 24. Along Highway 30 about .5 mile west of Spencer, Van Buren County, Tennessee.

Section 25. Along Highway 56 .8 mile northeast of store in Beersheba Springs, Grundy County, Tennessee.

Section 26. Along Highway 108 6.0 miles northwest of junction with Highway 56 near Altamont, Grundy County, Tennessee.

Section 27. Along Highway 64 1.1 mile southwest of Sewanee, Franklin County, Tennessee.

Although the Pennington is extremely variable the lithology, paleontology, and stratigraphic succession indicate that all eight of the upper Chester formations (Tar Springs, Vienna, Waltersburg, Menard, Palestine, Clore, Degonia, and Kinkaid) of the Mississippi Valley area are represented in it. In extreme northeastern Kentucky pre-Pennsylvanian erosion removed the Pennington entirely and the greater part of it in Morgan, Menifee, Powell, Estill, and Jackson Counties, Kentucky. Portions of a Glen Dean through Kinkaid sequence are exhibited southwest of Jackson County. Through Tennessee there is a fairly thick, massive, crystalline limestone at the top which is thought to be of Kinkaid age.

The sections indicate that the Pennington is fairly uniform in thickness, about 200 feet, where uneroded. Of this thickness more than three-fourths is shale and the remainder is limestone and some more or less locally occurring sandstones. Much of the shale is variegated with the greatest quantity in the central two-thirds and probably of Menard and Clore ages.

The nature of the sediments and the relative abundance of marine fossils imply that the formation was deposited in shallow, temperate marine waters some distance from a fairly low-lying land mass which was undergoing much decomposition in a warm, moist climate. The land-ocean relationships were relatively stable with but slight movements needed to remove a quantity of sediments from the land and scatter it somewhat irregularly over the adjacent ocean bottom. There is no evidence that the upper Chester sands of the Mississippi Valley could have come from this direction.

VITA

Virgil Dean Winkler was born near Danvers, Illinois, on February 9, 1917. After graduating from Mackinaw Township High School, Mackinaw, Illinois, he attended the University of Illinois where he received the degrees of Bachelor of Arts and Bachelor of Science in 1938, and Master of Science in 1939. He held a scholarship during his undergraduate work, an assistantship during the 1938-1939 school year and the Henry Strong Foundation Fellowship from 1939 to 1941. The summers of 1936, 1937, and 1938 were spent as laboratory assistant and field worker for the Illinois State Geological Survey.

He is a member of Sigma Xi, Phi Kappa Phi, Phi Beta Kappa, Pi Delta Phi, Illinois State Academy of Science and an associate member of the American Association of Petroleum Geologists.

He is co-author with A. H. Sutton, Department of Geology, University of Illinois, of "Mississippian Inadunta—*Eupachycrinus* and Related Forms," *Journal of Paleontology*, Vol. 14, No. 6, pp. 544-567, 1940.